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PATENT ABSTRACTS OF JAPAN

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(54) MEDIUM TO BE RECORDED, PRODUCTION THEREOF AND INK JET RECORDING METHOD USING MEDIUM TO BE RECORDED

(57)Abstract:

PURPOSE: To obtain a medium to be recorded having high ink absorbing speed and hard to generate a crack by providing an ink receiving layer having a porous structure containing alumina hydrate having a boehmite structure on a base material and setting the degree of crystallization of alumina hydrate to a specific range.

CONSTITUTION: In a medium to be recorded wherein an ink receiving layer 2 having a porous structure consisting of alumina hydrate and a binder is provided on a base material, alumina hydrate having a boehmite structure and characterized by that a degree of crystallization is 15-80 and the degree of parallelization of a fine crystal of alumina hydrate and the in-plane direction of the ink receiving layer is 1.5 or more is used in the ink receiving layer 2. A dispersion containing alumina hydrate having the boehmite structure is applied to the base material and dried under a relative humidity condition of 20-60% to set the degree of crystallization of alumina hydrate in the medium to be recorded to 15-80.



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CLAIMS

[Claim]

[Claim 1] The record medium-ed which is a record medium-ed equipped with the ink acceptance layer of porous structure on the base material, and is characterized by the degree of crystallinity of this hydrated alumina being in the domain of 15-80 including the hydrated alumina which has Boehmite structure

[Claim 2] The record medium-ed of the claim 1 which has the degree of crystallinity of a hydrated alumina within the limits of 20-70.

[Claim 3] The record medium-ed characterized by being the record medium-ed equipped with the ink acceptance layer of porous structure on the base material, and the parallelism of the microcrystal of this hydrated alumina and the field inboard of an ink acceptance layer being 1.5 or more including the hydrated alumina which has Boehmite structure.

[Claim 4] The record medium-ed of the claim 3 whose parallelism is two or more

[Claim 5] The record medium-ed which it is the record medium-ed equipped with the ink acceptance layer of porous structure on the base material, and the degree of crystallinity of this hydrated alumina is in the domain of 15-80, and is characterized by the parallelism of the microcrystal of this hydrated alumina and the field inboard of an ink acceptance layer being 1.5 or more including the hydrated alumina which has Boehmite structure

[Claim 6] The record medium-ed of the claim 5 which has degree of crystallinity within the limits of 20-70

[Claim 7] The record medium-ed of the claim 5 whose parallelism is two or more

[Claim 8] The ink-jet record technique characterized by using the record medium-ed of a publication for either of the claims 1, 3, and 5 in the ink-jet record technique of printing by making the globule of ink breathing out from fine pore, and giving a record medium-ed.

[Claim 9] The ink-jet record technique of the claim 8 which heat energy is made to act on ink and forms the globule of ink

[Claim 10] The manufacture technique of the record medium-ed characterized by applying **** stress to the coating liquid which is the manufacture technique of the record medium-ed equipped with the ink acceptance layer of porous structure, and contains this hydrated alumina including the hydrated alumina which has Boehmite structure, carrying out the coating of the coating liquid to a base material, and the parallelism of the microcrystal of this hydrated alumina and the field inboard of an ink acceptance layer carrying out to 1.5 or more

[Claim 11] The manufacture technique of the record medium-ed of the claim 10 which has the aforementioned **** stress in the or more $\{ 0.1 \text{Ns} / \text{m}^2 \}$ domain or less $\{ 20 \text{Ns} / \text{m}^2 \}$ of two.

[Claim 12] The manufacture technique of the record medium-ed characterized by being in the domain of degree of crystallinity 15-80, carrying out the coating of the distributed liquid containing the hydrated alumina which has Boehmite structure on a base material, and making the degree of crystallinity of the hydrated alumina in a record medium-ed into the domain of 15-80 by drying on the conditions of 20 - 60% of relative humidity.

[Claim 13] The manufacture technique of the record medium-ed characterized by carrying out the coating of the distributed liquid containing the hydrated alumina which is less than 15 degree of crystallinity, and has Boehmite structure on a base material, and making the degree of crystallinity of the hydrated alumina in a record medium-ed into the domain of 15-80 by drying on the conditions of 10 - 20% of relative humidity.

[Claim 14] The manufacture technique of the record medium-ed which carries out the coating of the distributed liquid containing the hydrated alumina which is less than 15 degree of crystallinity, and has Boehmite structure on a base material, dries, forms an ink acceptance layer, and is subsequently characterized by making the degree of crystallinity of the hydrated alumina in a record medium-ed into the domain of 15-80 by heat-treating on the conditions of 10 - 20% of xerensis relative humidity.

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DETAILED DESCRIPTION

[Detailed description]

[0001]

[The technical field to which invention belongs] this invention is a record medium-ed suitable for the record which used water color ink, and relates to the suitable record medium-ed especially for an ink-jet record.

[0002]

[Prior art] In recent years, although it makes the minute droplet of ink fly by various working principles, is made to adhere to record media-ed, such as paper, and records a picture image, a character, etc., an ink-jet recording mode has which characteristic feature with unnecessary development with the large versatility of a high-speed low ambient noise, ease [multiple-color-izing], and a record pattern and fixing, as a recording device of various picture images, begins an information device and has spread quickly in various kinds of intended use. Since the picture image furthermore formed by the multicolor ink-jet formula is possible also for obtaining multicolor printing by the platemaking formula, and the record which is equal as compared with the print by the color photography formula, and it is cheap rather than it is based on usual multicolor printing or a print when there is few creation number of copies, it is being widely applied even to a full color image recording field. Although enhancement of a recording device and the record technique has been performed in connection with the enhancement in recording characteristics, such as improvement in the speed of a record, highly-minute-izing, and full-color-izing, an advanced property has come to be demanded also from a record medium-ed.

[0003] The gestalt of a variety of record media-ed has been proposed from the former. For example, in the U.S. patent specification of No. 4879166, No. 5104730 and this publication-number 276670 [two to] official report, this 4 No. - 37576 official report, and this 5 No. -32037 official report, the record sheet which has the layer which used the hydrated alumina of pseudo-Boehmite structure is proposed. However, the following troubles have occurred in the conventional record medium-ed.

- (1) By printing of a color picture, since there are many amounts of ink, with the conventional record medium-ed, ink absorptive power is insufficient and a beading occurs.
- (2) Since the conventional record medium-ed of the surface hardness is inadequate, in case it prints, in it, it is easy to generate a blemish by contact into the conveyance fraction of a printer.
- (3) Since the conventional record medium-ed has the weak binding capacity of an ink acceptance layer, a crack produces it on a front face.
- (4) Since the conventional record medium-ed has the low homogeneity of an ink acceptance layer, its roundness of a printing dot is low.
- (5) Since the array of a pigment is not controlled, the conventional record medium-ed has low glossiness.

[0004]

[Object of the Invention] It was made in order that this invention might solve many above-mentioned troubles, and the purpose has high ink absorptive power, ink rate of absorption is quick, and it has sufficient surface hardness, and is going to obtain the record medium-ed which a crack seldom produces.

[0005] Moreover, this invention is excellent in the perfect circle nature of a printing dot, and aims at offering the record medium-ed which can form the picture image of a high gloss.

[0006] Furthermore, in addition to many above-mentioned properties, this invention aims at offering the durability of a printing object, and a record medium-ed [which was excellent light-fast and suppressed occurrence of a blot]

[0007]

[The means for solving a technical problem] The above-mentioned purpose is attained by the following this inventions [0008] Namely, this invention contains the hydrated alumina which has (1) Boehmite structure. The record medium-ed

which is a record medium-ed equipped with the ink acceptance layer of porous structure on the base material, and is characterized by the degree of crystallinity of this hydrated alumina being in the domain of 15-80, (2) It is the record medium-ed equipped with the ink acceptance layer of porous structure on the base material including the hydrated alumina which has Boehmite structure. The record medium-ed characterized by the parallelism of the microcrystal of this hydrated alumina and the field inboard of an ink acceptance layer being 1.5 or more, And it is the record medium-ed equipped with the ink acceptance layer of porous structure on the base material including the hydrated alumina which has (3) Boehmite structure. It is the record medium-ed which the degree of crystallinity of this hydrated alumina is in the domain of 15-80, and is characterized by the parallelism of the microcrystal of this hydrated alumina and the field inboard of an ink acceptance layer being 1.5 or more

[0009] Moreover, this invention is the ink-jet record technique characterized by using the aforementioned record medium-ed in the ink-jet record technique of printing by making the globule of ink breathing out from fine pore, and giving a record medium-ed.

[0010] Furthermore, this invention applies **** stress to the coating liquid which is the manufacture technique of the record medium-ed equipped with the ink acceptance layer of porous structure, and contains this hydrated alumina including the hydrated alumina which has Boehmite structure, and carries out the coating of the coating liquid to a base material. The manufacture technique of the record medium-ed characterized by the parallelism of the microcrystal of this hydrated alumina and the field inboard of an ink acceptance layer carrying out to 1.5 or more, Are in the domain of degree of crystallinity 15-80, and the coating of the distributed liquid containing the hydrated alumina which has Boehmite structure is carried out on a base material. The manufacture technique of the record medium-ed characterized by making the degree of crystallinity of the hydrated alumina in a record medium-ed into the domain of 15-80 by drying on the conditions of 20 - 60% of relative humidity, And by carrying out the coating of the distributed liquid or this distributed liquid containing the hydrated alumina which is less than 15 degree of crystallinity, and has Boehmite structure on a base material, and drying on the conditions of 10 - 20% of relative humidity Or it is less than 15 degree of crystallinity. It is the manufacture technique of the record medium-ed characterized by making the degree of crystallinity of the hydrated alumina in a record medium-ed into the domain of 15-80 by heat-treating the record medium-ed which comes to carry out the coating of the distributed liquid containing the hydrated alumina which has Boehmite structure on a base material on the conditions of 10 - 20% of relative humidity.

[0011] According to this invention, ink absorptive power is high, ink rate of absorption is quick, and it has sufficient surface hardness, and is hard to produce a crack, and the roundness of a printing dot can be high and gloss can obtain a high record medium-ed. Moreover, the durability of a printing object and the record medium-ed which was excellent light-fast and suppressed the blot can be obtained.

[0012]

[Gestalt of implementation of invention] Hereafter, this invention is explained in detail.

[0013] In one mode of the record medium-ed of this invention, as shown in drawing 1, the ink acceptance layer 2 of the porous structure which consists of a hydrated alumina and a binder is formed on a base material 1.

[0014] A hydrated alumina is desirable as a material used for an ink acceptance layer, in order not to produce problems, such as **** of the black ink which fixing of the color in ink is good and the picture image excellent in coloring nature is acquired since it has a positive charge, and has moreover been generated with the silica system compound, and a light-fast fall. Since the hydrated alumina which has Boehmite structure also in a hydrated alumina has good adsorptivity, ink absorptivity, and transparency of a color, it is more desirable.

[0015] The hydrated alumina which exists in the record medium-ed of this invention is defined by the following general formula.

[0016] $\text{aluminum}_2 - \text{the inside of } \text{O}_3\text{-n(OH)}_2\text{n and, and a mH}_2\text{O formula, and n -- one of the integers of 0-3 -- expressing -- m -- 0-10 -- it has the value of 0-5 preferably Since mH}_2\text{O is a thing showing the aqueous phase which does not participate in formation of a crystal lattice in many cases and which can be desorbed, m can also take the value which is not an integer. Moreover, when calcining of this kind of material is carried out, it is possible that m reaches the value of 0}$

[0017] Especially as the manufacture technique of the hydrated alumina which has the Boehmite structure contained in a record medium-ed by this invention, although not limited, any technique, such as the technique of manufacturing a hydrated alumina, for example, a Bayer process, and an alum thermal decomposition method, is employable. Preferably, the technique of adding an acid and hydrolyzing to the aluminum alkoxide of a long chain, is mentioned. For example, the carbon numbers are five or more alkoxides, and if the alkoxide of carbon numbers 12-22 is used further, since the elimination for alcohol which is mentioned later, and a configuration control of the hydrated alumina which has

Boehmite structure will become easy, it is desirable. As compared with the technique of manufacturing an alumina hydrogel and a cation nature alumina, there is an advantage of being hard to mix impurities, such as various ion, in the above-mentioned technique. Furthermore, since the alcohol after hydrolysis is easy to remove, the aluminum alkoxide of a long chain has the advantage that the dealcoholization of a hydrated alumina can be performed completely, as compared with the case where the alkoxide of short chains, such as aluminum isopropoxide, is used.

[0018] A hydrothermal synthesis can be performed further, grain can also be grown up, it can be made to be able to dry, and the hydrated alumina obtained by the above-mentioned technique can also obtain hydrated-alumina powder.

[0019] In this invention, the distributed liquid containing a hydrated alumina and a binder is prepared, and the record medium-ed which has a porous ink acceptance layer through processes, such as an application and xeraxis, on a base material is formed. The physical properties and property of a record medium-ed change according to manufacture conditions, such as the hydrated alumina and distributed liquid to use, and application xeraxis. In this invention, by controlling the degree of crystallinity and parallelism of a hydrated alumina in the ink acceptance layer of porous structure, the ink absorptivity was good and it found out that the record medium-ed which suppressed occurrence of a crack was obtained.

[0020] The degree of crystallinity in this invention is defined as follows. The hydrated-alumina grain 6 which has the Boehmite structure contained in the ink acceptance layer 2 is constituted by the amorphous fraction 10 and the crystalline-substance fraction (Boehmite microcrystal) 3 as shown in drawing 2 (a). Degree of crystallinity shows the rate of the crystalline-substance fraction (microcrystal) to the whole hydrated alumina which has Boehmite structure. It can ask for degree of crystallinity from each of a hydrated alumina or the hydrated alumina in a record medium-ed from the intensity ratio of the $2\theta = 10$ degree intensity in the X-ray diffraction view by Cukappa alpha rays which measured the ink acceptance layer of a hydrated alumina or a record medium-ed to what carried out the pulverization, and the peak intensity of the field which appears near $2\theta = 14-15$ degree (020). This degree of crystallinity is indicated by the Provisional-Publication-No. 76246 [56 to] official report, and the Provisional-Publication-No. 95985 [56 to] official report.

[0021] The degree of crystallinity of the hydrated alumina in the record medium-ed of this invention has the desirable domain of 15-80. If it is this domain, the ink absorbed dose and rate of absorption are good. The domains of degree of crystallinity are 20-70 more preferably. If it is this domain, a surface hardness will be still high and it will be hard coming to generate a crack. When the degree of crystallinity of the hydrated alumina in a record medium-ed is less than 15, the absorbed dose of ink and rate of absorption run short, and since the compatibility with water becomes small when degree of crystallinity exceeds 80, it becomes easy to generate a beading.

[0022] The parallelism in this invention is defined as follows. The orientation of a field of the field (020) 4 of the crystalline-substance fraction 3 exists at random in the hydrated-alumina grain 6 as shown in drawing 2 (a). Parallelism shows the rate of the Boehmite microcrystal which arranges the orientation of a field of a field (020) to the field inboard of an ink acceptance layer, and parallel in all the Boehmite microcrystals contained in an ink acceptance layer. Since the hydrated alumina has a field (020) 4 and the field (120) 5 as shown in drawing 2 (d), it is performed to the ink acceptance layer which carried out the pulverization of the X-ray diffraction by Cukappa alpha rays to the ink acceptance layer 6, asks for the intensity ratio of both field (020) 4 and the field (120) 5, respectively, and asks for parallelism from the intensity ratio. Here, the orientation of a field (020) of the parallelism of the completely random ink acceptance layer which carried out the pulverization is 1. Drawing 2 (a) As shown in - (c), in connection with the rate with parallel orientation of a field (020) and field inboard of an ink acceptance layer increasing, parallelism becomes high.

[0023] Since the roundness of a printing dot becomes high with [the parallelism of the hydrated-alumina microcrystal in the record medium-ed of this invention] 1.5 [or more], it is desirable. The roundness of a printing dot becomes [parallelism] low less than by 1.5. A still desirable domain is two or more, and the gloss of a record medium-ed becomes high.

[0024] The ink absorber style of the record medium-ed in this invention is considered as follows. The ink droplet which reached the front face of a record medium-ed is mainly (020) absorbed between fields. In that case, as shown in drawing 3 (a), since it is random, with the record medium-ed with low parallelism, as for a diffusion of ink, the sense of a field (020) becomes uneven to the field inboard of an ink acceptance layer. As shown in drawing 3 (b) to it, in the record medium-ed with high parallelism, the diffusion of ink is uniform in the field of an ink acceptance layer. Parallelism is conjecturing 1.5 or more record media-ed that the roundness of a printing dot becomes high for the above-mentioned ground. In addition, in drawing 3, 7 shows the microcrystal of the hydrated-alumina grain which ink 8 permeated. Moreover, 9 is the print head of a printer.

[0025] Moreover, hydrated aluminas differ in the rate of an optical refraction in a crystalline-substance fraction and an amorphous fraction. Therefore, light scattering of the record medium-ed with the random orientation of the field (020) of a hydrated alumina is large, and there is little light scattering of the record medium-ed to which the orientation of a field is conversely (020) equal. Therefore, it is being surmised that the record medium-ed whose parallelism is two or more has little light scattering, and glossiness becomes high.

[0026] In addition to the property described above when the degree of crystallinity of the hydrated alumina in a medium was 80 or less [15 or more] and the parallelism of a hydrated-alumina microcrystal was 1.5 or more, the durability of a picture image and its light resistance are good, and since the record medium-ed of this invention can prevent a blot of the color by the aging, it is desirable. Since the compatibility with ink gets worse when degree of crystallinity is outside the above-mentioned domain, a blot, a crawling, and a beading occur or ink rate of absorption becomes slow. Since the bonding strength of a color and a record medium-ed will become weak if parallelism becomes out of the above-mentioned domain, it becomes easy to generate a blot. The ground is guessed as follows. The color in the printed ink is adsorbed between the fields (020) of a hydrated-alumina microcrystal. Since the number of fields (020) increases, if the adsorption site of a color increases and parallelism becomes high further, since the field (020) of a hydrated-alumina microcrystal is complete, an interaction works, the adsorption power of a color becomes strong and the adsorbed color has come to seldom desorb the record medium-ed with high degree of crystallinity with a record medium-ed here. Therefore, the effect mentioned above is acquired in the record medium-ed of above-mentioned [degree of crystallinity and parallelism] within the limits.

[0027] The record medium-ed which used the pilliform flux alumina which carried out orientation in the fixed orientation is indicated by the publication-number 276670 [two to] official report mentioned above. The medium which was made to carry out orientation of the grain of a hydrated alumina in this official report, and specified the parallelism of the field (020) in the record medium-ed of this invention is a different configuration. The roundness and gloss which are furthermore the effect of this invention are not indicated by this official report, but, as for this invention thought differs.

[0028] The degree of crystallinity of the hydrated alumina in a record medium-ed is variously changeable by controlling the heating conditions at the time of xeraxis of the distributed liquid containing the aforementioned hydrated alumina. By applying and carrying out the coating of the **** stress to the distributed liquid containing the aforementioned hydrated alumina, parallelism is variously changeable independently.

[0029] As for the hydrated alumina used by this invention, it is desirable that the domains of degree of crystallinity are 15-80 makes the degree of crystallinity of the hydrated alumina in a record medium-ed the above-mentioned convention domain at the point made easily. Degree of crystallinity is able to change degree of crystallinity for at least less than 15 hydrated alumina at a back process. It can use plate-like, even if the configuration of a hydrated alumina is needlelike. If needlelike, since the domain of 1-50nm is low the maximum length and plate-like, the viscosity of a particle diameter of distributed liquid is desirable at a diameter at the maximum equator. Furthermore, the above-mentioned domain has the more desirable viscosity of distributed liquid at the point which becomes low, and the point which the crack and powder omission of a record medium-ed come to seldom generate. As pore volume of an alumina, since an ink absorptivity has the good domain of 0.1-1.0cm³/g, it is desirable. Since an ink absorptivity has the good domain of 2.0-20.0nm, the pore radius of a hydrated alumina is desirable. OK, since the domain of Hayes of an ink acceptance layer of 10-500m²/g decreases, the specific surface area of an alumina is desirable for picture image observation according a glossy picture image to the transmitted light.

[0030] In this invention, the coating of the distributed liquid which contains the aforementioned hydrated alumina and a binder on a base material is carried out. The direction of flow of coating liquid and the orientation of a field (020) of the microcrystal in a hydrated alumina can be arranged in parallel by applying the **** stress of a specific domain to coating liquid at the time of a coating. The record medium-ed with high parallelism can be obtained by carrying out the coating of the distributed liquid to apply to a base material. Although it changes with viscosity of the coating technique or distributed liquid, it is desirable, and in this domain, the domain to 2 or more [0.1Ns //m] Ns / 20.0 //m² can carry out orientation of the microcrystal of a hydrated alumina, and, as for the **** stress to apply, can make parallelism 1.5 or more. It is difficult for **** stress to make parallelism 1.5 or more below at the lower limit of the above-mentioned domain. Above the above-mentioned domain upper limit, the thickness of an ink acceptance layer tends to become [**** stress] uneven.

[0031] If it is the technique of applying the **** stress of the above-mentioned domain as the coating technique, although it can use by any coating technique, a kiss coat, an extrusion coat, a slide hopper coat, a curtain coat, a blade coat, an air knife coat, a brush coat, a bar coat, and a gravure coat are desirable.

[0032] Moreover, it depends for the optimum coating speed on the coating technique. It is desirable that coating speeds, such as a kiss coat, an extrusion coat, a slide hopper coat, a curtain coat, and a bar coat, control [s] a coating speed by the coating technique related to **** stress in 0.01-10m /s. Since **** stress is hardly applied in s less than 0.01m /s, parallelism tends to become low. Moreover, when s is exceeded in 10m /s, it is hard coming to control the thickness of an ink acceptance layer uniformly. The distributed liquid viscosity at the time of a coating has the desirable domain of 10 - 500mPa and s. By under 10mPas and s, since **** stress is seldom applied to distributed liquid, the parallelism of the hydrated-alumina microcrystal in a record medium-ed tends to become low. Moreover, if 500mPas and s are exceeded, it will be hard coming to control the thickness of an ink acceptance layer uniformly. The amount of coatings of distributed liquid has the desirable domain of 2-60g/m² at a xeraxis solid-content conversion.

[0033] After carrying out the coating of the distributed liquid, as for more than for 1 second, it is desirable to make it **** and set, while it has been in the status to which it conveyed in the status that a xeraxis wind is not sent, and the sense of the field (020) of the microcrystal in a hydrated alumina was equal using the ***** nature of coating liquid. If a xeraxis wind is sent in the status that it does not set, after a coating, an alumina will move, the sense of the field (020) of the microcrystal in the hydrated alumina which applied and arranged **** becomes random, and, as a result, parallelism becomes low.

[0034] The stoving of the distributed liquid containing the hydrated alumina by which the coating was carried out is carried out, and an ink acceptance layer is formed. According to this invention persons' knowledge, degree of crystallinity is controllable in the above-mentioned convention domain by making three items of a heating rate, drying temperature, and the drying time into a specific domain. Degree of crystallinity can be dedicated to above-mentioned [degree of crystallinity] within the limits by controlling the humidity of a xeraxis process, temperature, and the drying time especially depending on a rate of drying. If it dries in the conditions of 20% - 60% of relative humidity in producing a medium using the distributed liquid containing the hydrated alumina of degree of crystallinity 15-80, the degree of crystallinity of a record medium-ed can be dedicated to above-mentioned within the limits. At less than 20% of relative humidity, since the variation per unit time of the degree of crystallinity of the hydrated alumina in a record medium-ed is large, a control of the degree of crystallinity of a record medium-ed becomes difficult. Since the rate of drying of a paint film is too slow when 60% is exceeded, it is easy to produce thickness nonuniformity in an ink acceptance layer.

[0035] When degree of crystallinity produces a medium using the distributed liquid containing less than 15 hydrated alumina, if it dries in 10 - 20% of relative humidity, the degree of crystallinity of the hydrated alumina in a record medium-ed can be dedicated to above-mentioned within the limits. Moreover, the distributed liquid containing a with a degree of crystallinity of less than 15 hydrated alumina can be dedicated on a base material as other technique, it can dry, an ink acceptance layer can be formed and degree of crystallinity can be dedicated to the above-mentioned domain a coating and by heat-treating a record medium-ed on the conditions of 10 - 20% of relative humidity. Since relative humidity rises at less than 10% abruptly [the degree of crystallinity of the hydrated alumina in a record medium-ed] within unit time, it is hard coming to control degree of crystallinity or less to 80, and is easy to generate a crack. Since the degree of crystallinity of a record medium-ed will not increase if relative humidity exceeds 20%, it cannot be made above-mentioned convention within the limits.

[0036] Generally 60 degrees C - 150 degrees C and a heating time have [heating temperature] 30 or less minutes desirable although optimum stoving temperature and stoving time do not generally have ***** in order to be dependent on composition of coating liquid etc. 2 seconds or more. Even if drying temperature is the above-mentioned humidity requirement at less than 60 degrees C, it is difficult to make degree of crystallinity into above-mentioned within the limits. Since a rate of drying is too quick when 150 degrees C is exceeded, degree of crystallinity exceeds the above-mentioned domain upwards, and it becomes easy to generate a crack. Since the drying time is inadequate in less than 2 seconds, a heating time tends to generate nonuniformity in a thickness. Change of degree of crystallinity is ineffective as for 30 minutes or more in a heating time, in order to end within 30 minutes.

[0037] In the above-mentioned explanation, various dryers, such as a dryer, roll heating, etc. which used hot air drying equipments, such as a direct tunnel dryer, an arch dryer, an air loop dryer, and ***** air-flow ***** , an infrared-heating dryer, microwave, etc. as the heating technique, can be used.

[0038] The binder used with a hydrated alumina by this invention can be chosen freely out of a water soluble polymer, and can be used for example, polyvinyl alcohol or its denaturation field (anion denaturation cation denaturation ->) Silanol denaturation, a starch or its denaturation field (oxidization, etherification), gelatin, or its denaturation field, Casein or its denaturation field, a carboxymethyl cellulose, gum arabic, Cellulosics, such as a hydroxyethyl cellulose and the hydroxypropyl methylcellulose, Conjugated-diene system copolymer latexes, such as SBR latex, NBR latex,

and a methyl methacrylate-butadiene copolymer, Vinyl system copolymer latexes, such as a functional-group denaturation polymer latex and an ethylene-vinyl acetate copolymer, a polyvinyl pyrrolidone, a maleic anhydride or its copolymer, an acrylic-ester copolymer, etc. are desirable. On weight criteria, the mixing ratio of the hydrated alumina which has Boehmite structure, and a binder has the desirable domain of 5.1-25.1, and if it is this within the limits, it can prevent a crack and powder omission. Furthermore, desirable domains are 5.1-20.1 and the crack produced when a record medium-ed is bent can also prevent them.

[0039] To the pigment and the binder, it is also possible to add a pigment agent, a thickener, pH regulator, lubricant, a fluid modifier, a surfactant, a defoaming agent, a deck-watertight-luminaire-sized agent, a foam suppressor, a mold releasing agent, a foaming agent, a penetrating agent, a tinction color, a fluorescent brightener, an ultraviolet ray absorbent, an antioxidant, antiseptics, and a ** motorcycle agent if needed.

[0040] As a deck-watertight-luminaire-sized agent, it can choose freely out of well-known materials, such as quaternary ammonium salt and a quaternary-ammonium-salt polymer, and can use

[0041] The sheet-like matter and **** like papers, such as the paper which performed sizing moderate as a base material, non-size paper, and a resin coat paper, and a thermoplastic film can be used. In the case of a thermoplastic film, bright films, such as polyester, polystyrene, a polyvinyl chloride, a polymethylmethacrylate, cellulose acetate, polyethylene, and a polycarbonate, and the sheet by restoration or a detailed foaming of a pigment which carried out the opacification can also be used.

[0042] The total pore volume of the ink acceptance layer which constitutes the record medium-ed of this invention has the desirable domain of 0.1-1.0cm³/g. When the pore volume of an ink acceptance layer is larger than the above-mentioned domain, a crack and powder omission occur in an ink acceptance layer, and when absorption of ink becomes bad at a parvus case and especially a multicolor printing is performed rather than the above-mentioned domain, ink overflows from an ink acceptance layer and it is easy to generate a blot in a picture image.

[0043] About the BET specific surface area of an ink acceptance layer, the domain of 20-450m²/g is desirable. Since the glossiness of an ink acceptance layer disappears from this domain a parvus case and Hayes increases, white **** came to have started a picture image. Moreover, when larger than the above-mentioned domain, it becomes easy to produce a crack in an ink acceptance layer. After carrying out degassing processing of the value of the aforementioned BET specific surface area and pore volume at 120 degrees C for 24 hours, it is calculated by the nitrogen adsorption desorption technique.

[0044] The ink used for the record technique of this invention mainly contains color material (a color or pigment), the water-soluble organic solvent, and water. As a color, the water soluble dye represented by direct dye, acid dye, basic dye, a reactive dye, the food color, etc., for example is desirable, and either can be used if the picture image with which the performance as which fixing nature, coloring nature, clear nature, a stability, and light-fast others are required in the combination with a record medium-ed is filled is given.

[0045] Although a water soluble dye is used by melting into the solvent which generally consists of water or water, and an organic solvent and mixture, such as desirable water, water-soluble, various desirable organic solvents, etc., is used as these solvent components, it is desirable that the moisture content in ink adjusts so that it may become 60 - 90wt% within the limits preferably 20 - 90wt%.

[0046] As the above-mentioned water-soluble organic solvent, for example Methyl alcohol, ethyl alcohol, n-propyl alcohol, isopropyl alcohol, n-butyl alcohol, Carbon numbers, such as sec-butyl alcohol, tert-butyl alcohol, and isobutyl alcohol, the alkyl alcohols of 1-4, Amides, such as a dimethylformamide and a dimethylacetamide, an acetone, Ketones, such as ***** alcohol, or ketone alcohol, a tetrahydrofuran, Polyalkylene glycols, such as ether, such as a dioxane, i polyethylene glycol, and a polypropylene glycol Ethylene glycol, a propylene glycol, 1 and 2, 6-hexane triol, The alkylene glycols in which alkylene machines, such as a thiodiglycol, a hexylene glycol, and a diethylene glycol, have 2-6 carbon atoms A glycerol; ethylene glycol methyl ether, a diethylene-glycol methyl ether, The low-grade alkyl ether of polyhydric alcohol, such as diethylene-glycol ethyl ether, the triethylene-glycol monomethyl ether, and the triethylene-glycol monoethyl ether, is mentioned

[0047] Also of the water-soluble organic solvent of these many, the low-grade alkyl ether of polyhydric alcohol, such as polyhydric alcohol, such as a diethylene glycol, the triethylene-glycol monomethyl ether, and the triethylene-glycol monoethyl ether, is desirable. Since the effect of polyhydric alcohol as lubricant for preventing the blinding phenomenon of a nozzle based on the water in ink evaporating and a water soluble dye separating is large, it is especially desirable

[0048] A solubilizing agent can also be added to ink. Typical solubilizing agents are nitrogen-containing heterocycle formula ketones, and are for the operation made into the purpose to raise the solubility over the solvent of a water

soluble dye by leaps and bounds. For example, N-methyl-2-pyrrolidone, 1, and 3-dimethyl-2-imidazolidinone is used preferably. Furthermore because of an improvement of a property, additives, such as a viscosity controlling agent, a surfactant, a surface tension regulator, pH regulator, and a specific-resistance regulator, can also be added and used. [0049] As technique of keeping on record by giving the above-mentioned ink to the aforementioned record medium-ed, the ink-jet record technique may be desirable, and as long as this record technique is the technique of making desorb ink more effectively than a nozzle and giving ink to a record medium-ed, any technique is sufficient as it. By the technique indicated by especially the Provisional-Publication-No. 59936 [54 to] official report, the ink which received the operation of heat energy produces a rapid volume change, and the ink-jet formula which makes ink breathe out from a nozzle can be effectively used by the applied force by this change of state.

[0050]

[Example] Below, an example and the example of a comparison explain this invention in detail. At this time, evaluation of many physical properties about this invention was performed in the following way.

[0051] From the X-ray diffraction pattern which performed the ink acceptance layer separated from degree of crystallinity and the record medium-ed [parallelism] to what carried out the pulverization, the peak intensity of the intensity in 2θ =10 degree and (020) a field, and a field (120) was obtained. Moreover, the peak intensity of a field (020) and (120) a field was obtained from the X-ray diffraction pattern performed to the ink acceptance layer separated from the record medium-ed. Furthermore, it asked for degree of crystallinity and parallelism by the following formula. [0052] In the intensity-ratio above of the intensity ratio/powder of the peak intensity parallelism = medium of the field (120) of the peak intensity/medium of the field (020) of the intensity-ratio = medium of the peak intensity medium (ink acceptance layer) of the field (120) of the peak intensity/powder of the field (020) of the intensity-ratio = powder of the on-the-strength powder (peak intensity / 2θ =10 degree) of a degree-of-crystallinity = (020) side, X-ray diffraction measurement was performed on condition that the following.

[0053] Measuring-device: RAD-2R (product made from Physical science Electrical and electric equipment)

Target: Cu kappaalpha optical-system: wide angle goniometer (with [a graphite curve monochromator])

***** Radius:185mm slit:DS1 degree RS1 degree SS0.15mmX line output:40kV -- the 30mA measurement

condition. 2θ -theta method 2 -- every θ = 0.02 degrees continuous -- scanning 2θ =10-90 degree 2 degrees/min

[0054] After heating and degassing enough the record medium-ed [[BET specific surface area and pore volume]], it measured using the nitrogen adsorption desorption method.

- The calculation of measuring device: can taxi loan company make, and auto ***** 1 and a BET specific surface area used Brunauer's et al. technique (J. Am. Chem. Soc., 60 volumes, 309 pages, and 1938).

- The calculation of pore volume used Barrett's et al. technique (J. Am. Chem. Soc., 73 volumes, 373 pages, and 1951).

[0055] [Ink absorbed dose] The ink of the following composition performed the ink-jet record to 1mm at intervals of the nozzle of 16 rates using the ink jet printer with which Y, M, C, and Bk ***** the ink-jet head equipped with 128

nozzles four times. Specifically, the finger touched and estimated the dryness of the ink of an acceptance layer front face to the Records Department immediately after carrying out the solid printing of the ink of Bk in one color. At this time, the amount of ink in a monochrome printing was made into 100% and the thing from which ink does not adhere to a finger that from which ink does not adhere to a finger at the 200% of the amounts of ink at O and the 100% of the amounts of ink -- ** -- said -- when ink adhered to the finger at 100%, it considered as x

[0056] Ink composition and C.I. hood black 2 5 sections and diethylene glycol 15 sections and polyethylene glycol 20 sections and water The 70 sections [0057] The monochrome solid printing of the ink of Bk was carried out in the ink jet printer and ink which were used for the [ink rate-of-absorption] ink absorbed-dose examination. The amount of ink was made into 200% at this time. Then, the finger described the Records Department for the dryness of ink, and it evaluated in time until ink stops adhering to a finger.

[0058] The surface hardness of a record medium-ed was inspected by the pencil scratch test for [surface-hardness] paint films (JIS K 5401-1969).

[0059] By [crack] viewing, the occurrence condition of the crack of a record-medium-ed front face was inspected. What has generated in O what a crack is not accepted in at this time, and has generated what is generated partially all over ** was made into x

[0060] In the ink jet printer and ink which were used for the [roundness] ink absorbed-dose examination, after printing dot of the ink of Bk at a time, d/D when measuring major-axis D of 1 dot and minor-axis d under a microscope was made into roundness.

[0061] The gloss of the non-printing section was measured with the [gloss] glossmeter (Honba Make, gross checkered IG-320)

[0062] After carrying out a solid printing in one color in the ink jet printer and ink which were used for the [waterproof] ink absorbed-dose examination, the air drying of the record medium-ed was carried out after immersing for 3 minutes into the stream, and it asked for durability by the following formula

water-resistance = (picture image concentration before immersing [picture image concentration / stream immersing] after stream immersing) $\times 100$ -- or more for 95, the value of this water resistance made ** O and 88 or more [less than 95], and made less than 88 x

[0063] In the ink jet printer and ink which were used for [light resistance] ink absorbed-dose examination, the monochrome solid printing of the ink of Bk was carried out. The amount of ink was made into 100% at this time. then, the inside of a room temperature -- a record medium-ed -- leaving it -- the tint (L*) of the Records Department of after (the 1 day of after a printing, and 30 days) -- evaluating -- the rate of change -- computing -- **10% or less -- O -- said -- what exceeds ** and **20% for **20% or less was made into x

[0064] After printing 1 dot of monochrome in the ink jet printer and ink which were used for the [blot] aforementioned ink absorbed-dose examination, the major axis of the printing dot of after (one day and 30 days) was measured blot = (major-axis [on the 30th] / major axis on the 1st) $\times 100$ -- the thing [O] to which the value of this blot exceeded 105 or less, and exceeded ** and 110 or less for 105 to 110 was made into x

[0065] Aluminum ***** was manufactured by the technique indicated by the example 1 - 4 U.S. patent specification of No. 4242271. Next, by the technique indicated by the U.S. patent specification of No. 4202870, the aforementioned aluminum ***** was hydrolyzed and the alumina slurry was manufactured. Water was added until the hydrated-alumina solid content which has Boehmite structure became 7.9% about this alumina slurry. pH of an alumina slurry was 9.5. 3.9% of the nitric-acid solution was added, pH was adjusted, and the colloidal sol was obtained on each digestion condition shown in Table 1. By spray-drying this colloidal sol at 85 degrees C, the hydrated-alumina powder which has Boehmite structure was produced.

[0066]

[Table 1]

表 1 アルミナの熟成条件

熟成条件/例	実施例 1	実施例 2	実施例 3	実施例 4
熟成前 pH	6.6	6.6	6.8	6.4
熟成温度 (°C)	48	49	50	35
熟成期間 (日)	14	16	18	16
熟成装置	オープン	オープン	オープン	オープン
結晶化度	20.2	31.0	45.5	26.1
BET比表面積 (m ² /g)	200	180	210	230
総孔容積 (cm ³ /g)	0.70	0.75	0.71	0.68

[0067] furthermore, the hydrated alumina which has the aforementioned Boehmite structure in ion exchange water -- 17wt% -- alumina variance liquid was prepared by mixing moreover, polyvinyl alcohol (it is described as "PVA" the Nippon Synthetic Chemical Industry [Co., Ltd.] Co., Ltd. make, a tradename "Gosenol NH18", and the following) -- the inside of ion exchange water -- 17wt% -- PVA solution was prepared by mixing Furthermore, coating liquid was prepared by mixing alumina variance liquid and PVA solution by the proportion of 18:1 by weight criteria. After applying this coating liquid on a resin coat paper using an extrusion coating machine by the coating temperature of 100 degrees C, the **** stress of 7.5Ns/m², it conveyed in the status that a xeraxis wind is not sent, for 1 second, and **** and the set of it were done using the ***** nature of coating liquid. Then, it dried for 30 seconds at the temperature

shown in Table 2 in the environment of 40% of relative humidity.

[0068] Thus, it evaluated about the printing property etc. to the obtained record medium-ed. A result is shown in Table 2.

2

[0069]

[Table 2]

表2 実施例1～4における被記録媒体の評価結果

	実施例1	実施例2	実施例3	実施例4
乾燥温度 (°C)	72	80	90	72
結晶化度	19.8	32.2	47.5	28.1
インク吸収量	○	○	○	○
インク吸収速度	10秒以下	10秒以下	10秒以下	10秒以下
表面硬度	HB	H	H	H
クラック	△	○	○	○
BET比表面積(m ² /g)	180	165	185	195
細孔容積(cm ³ /g)	0.50	0.58	0.56	0.51

[0070] The record medium-ed was produced like examples 1-4 except having changed the digestion conditions and xerensis conditions of a hydrated alumina of having example 5 Boehmite structure, as shown in Table 3, having changed the drying temperature of a record medium-ed into 68 degrees C, and having changed the drying time into 50% of relative humidity for 30 seconds (before heating). Thus, the obtained record medium-ed was further heated for 30 minutes in the oven maintained at 80 degrees C and 12% of relative humidity (after heating). The property before and behind heating was evaluated about the record medium-ed which carried out such and was produced. A result is shown in Table 4. Degree of crystallinity increased by heating and the ink absorptivity of the record medium [-ed] produced by this example improved in connection with it so that more clearly than Table 4.

[0071]

[Table 3]

表3 実施例5～11におけるアルミナ水和物の作製条件

実施例	5	6～10	11
熟成前 pH	6.4	6.3	6.1
熟成温度 (°C)	32	34	33
熟成期間 (日)	15	18	16
熟成装置	オープン	オープン	オープン
結晶化度	10.0	47.2	12.0
BET比表面積(m ² /g)	220	235	230
細孔容積(cm ³ /g)	0.73	0.75	0.71

[0072]

[Table 4]

表4 実施例5における被記録媒体の評価結果

	加熱前	加熱後
結晶化度	10.0	19.0
平行度	2.2	2.2
インク吸収量	△	○
インク吸収速度	17秒	10秒以下
表面硬度	F	H
クラック	△	○
真円度	0.89	0.87
光沢	52	53
BET比表面積(m ² /g)	190	190
細孔容積(cm ³ /g)	0.56	0.56

[0073] The digestion conditions and xerensis conditions of a hydrated alumina of having the example 6 - 10 Boehmite structure were carried out as shown in Table 3, and others prepared distributed liquid like examples 1-4. And the application xerensis of the distributed liquid was carried out by the extrusion coating machine. 0.2Ns/m² (example 6)

or 6.0Ns/m² (example 7) or 10.0Ns/m² (example 8) or 14.0Ns/m² of the **** stress applied to coating liquid were set to 2 (example 9), 18.0Ns/m² (example 10) m then. At this time, **** stress was adjusted by changing the slit width and the knockout pressure of a coating head. The coverage was unified to 6g/m².

[0074] Moreover, after carrying out in s in 1m /and carrying out a coating on a base material, for 1 second, the coating speed was conveyed in the status that a xerensis wind is not sent, and did **** and the set of using the ***** nature of coating liquid. Then, it was made to dry for 20 seconds with the drying temperature of 90 degrees C in the environment of 40% of relative humidity. Thus, it evaluated about the printing property etc. to the obtained record medium-ed. A result is shown in Table 5. As shown in Table 5, parallelism changed in connection with change of **** stress which adds the record medium-ed produced by this example to coating liquid, and gloss changed in connection with it.

[0075]

[Table 5]

表5 実施例6～10における被記録媒体の評価結果

実施例	6	7	8	9	10
ズリ応力(N/m ²)	0.2	6.0	10.0	14.0	18.0
平行度	2.2	3.3	3.5	3.1	2.1
真円度	0.88	0.92	0.95	0.93	0.87
光 沢	53	62	68	59	51
BET比表面積(m ² /g)	193	193	193	193	193
細孔容積(cm ³ /g)	0.57	0.57	0.57	0.57	0.57

[0076] The digestion conditions and xerensis conditions of a hydrated alumina of having example 11 Boehmite structure were carried out as shown in Table 3, and others prepared distributed liquid like the example 1. And the record medium-ed was produced like the example 1 except having ****ed relative humidity to 15%. A result is shown in Table 6. As shown in Table 6, in connection with increase and it, the ink absorptivity of the hydrated alumina in the record medium-ed produced by this example improved degree of crystallinity.

[0077]

[Table 6]

表6 実施例11における被記録媒体の評価結果

実施例	11
結晶化度	20.0
インク吸収量	1.6
インク吸収速度	○
表面硬度	11
クラック	○
BBT比表面積(m^2/g)	195
細孔容積(cm^3/g)	0.56

[0078] The digestion conditions and xeraxis conditions of a hydrated alumina of having the example 12 - 15 Boehmite structure were carried out as shown in Table 7, and others prepared distributed liquid like the example 1. And the application xeraxis of the distributed liquid was carried out by the kiss coating machine. The **** stress applied to coating liquid is shown in Table 7 then. Moreover, the **** stress at this time was adjusted by changing the slit width and the knockout pressure of a coating head, and the coverage was unified to $7\text{g}/\text{m}^2$. Moreover, after carrying out in s ir $0.8\text{m}/\text{and}$ carrying out a coating on a base material, for 1 second, the coating speed was conveyed in the status that a xeraxis wind is not sent, and did **** and the set of using the ***** nature of coating liquid. Furthermore, it was made to dry for 25 seconds with the drying temperature of 85 degrees C under the environment of 35% of relative humidity. Thus, it evaluated about the property to the obtained record medium-ed. A result is shown in Table 8.

[0079]

[Table 7]

表7 アルミナ水和物の熟成条件・施工条件

実施例	1 2	1 3	1 4	1 5
熟成前pH	6.3	6.6	6.3	6.5
熟成温度(℃)	35	38	40	33
熟成期間(日)	16	12	15	17
熟成装置	オープン	オープン	オープン	オープン
結晶化度	16.0	45.2	52.3	30.0
ズリ応力(N/m ²)	0.2	10.8	19.8	0.3
BET比表面積(m ² /g)	225	215	210	220
細孔容積(cm ³ /g)	0.70	0.71	0.71	0.70

[0080]

[Table 8]

表8 実施例1 2～1 5における被記録媒体の評価結果

実施例	1 2	1 3	1 4	1 5
結晶化度	16.5	45.3	52.6	28.6
平行度	1.6	1.8	2.6	1.7
耐光性	○	○	○	△
耐水性	△	○	○	○
しみ	○	○	○	○
BET比表面積(m ² /g)	190	187	185	188
細孔容積(cm ³ /g)	0.51	0.52	0.52	0.51

[0081]

[Effect of the invention] According to this invention, there are the following effects.

- 1) By making the degree of crystallinity of the hydrated alumina in a record medium-ed into the above-mentioned domain, there is much ink absorbed dose, ink rate of absorption is quick, and the high record medium-ed of a surface hardness can be obtained.
- 2) By making parallelism of the hydrated-alumina microcrystal in a record medium-ed into the above-mentioned domain, the record medium-ed with high roundness and gloss of a printing dot can be obtained.

3) By making the degree of crystallinity of the hydrated alumina in a record medium-ed, and parallelism of a hydrated-alumina microcrystal into the above-mentioned domain, it excels in light resistance and durability and the good printing object with which occurrence of a blot was suppressed can be obtained

[Translation done.]

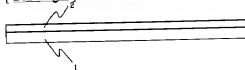
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- 1 This document has been translated by computer. So the translation may not reflect the original precisely
- 2 **** shows the word which can not be translated.
- 3 In the drawings, any words are not translated.

DRAWINGS

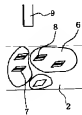
[Drawing 1]



[Drawing 3]

(a) 平行度：低

(b) 平行度：高



[Drawing 2]

(a) 平行度：低

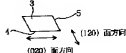
(b) 平行度：中位



インク受容層の面内方向

(c) 平行度：高

(d) アルミナ水和物酸結晶の正内方可



(100) 面方向

[Translation done]